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Article

Institutions and Ecosystem-Based Development Potentials of the Elephant Marsh, Malawi

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Abstract: The Elephant Marsh, a wetland in Southern Malawi, is important for fishing, agriculture, hunting and the collection of natural resources for the livelihoods of local communities. However, there has been increasing pressure driven by a changing climate, population growth, rural poverty and agricultural conversion, all of which threaten the future of the wetland. Currently, Malawi does not have either a national wetland policy or a climate change policy and wetland issues are only marginally present in the National Parks and Wildlife Policy of 2000 and National Fisheries and Aquaculture Policy of 2001. As a result, the country lacks a framework that could be strong enough to achieve balanced and sustainable wetland management for multiple resource users. The objective of this study was to establish the development potentials of Elephant Marsh from an ecosystem-based ('working-with-nature') perspective. It was revealed that there are development potentials in fisheries, recession agriculture, biomass for energy, conservation and tourism. This paper emphasizes that as these opportunities are developed, there will be the need to strengthen management institutions at local and national levels, and the coordination between the two.

Keywords: Elephant Marsh; wetland; Malawi; local institutions; ecosystem-based management; livelihoods; co-management

1. Introduction

Wetlands and other aquatic ecosystems cover about 20% of Malawi's surface area. The 1971 Ramsar Convention, of which Malawi is a party, defines a wetland as any area of marsh, fern, peat, land or water, whether natural or artificial, permanent or temporary with water that is static or flowing, fresh, brackish or salty, including areas of marine waters, the depth of which does not exceed six meters at low tide. As Turner *et al.* [1] observed, wetlands are the only single group of ecosystems that have their own global framework for conservation and wise use (maintenance of the ecological character). For a wetland to qualify as a designated Ramsar site, it has to exhibit unique ecological, botanical, zoological, limnological or hydrological importance. In Malawi, only Lake Chilwa (224,800 hectares) has been designated as a Ramsar site.

Despite its long history and importance, the Elephant Marsh in southern Malawi is not designated as a Ramsar site. It is also one of the least studied wetlands in Malawi. The publications that do exist [2–4] focus almost entirely on fisheries management. In 2004, an inventory was made of potential strategies for the management of crocodiles and hippopotamus in the Lower Shire region of Malawi that included the Elephant Marsh [5]. This inventory however lacks attention on the integration of conservation with local livelihoods, as is the case in ecosystem-based management.

Ecosystem-based management is commonly defined as an integrated, science-based approach to the management of natural resources that aims to sustain the health, resilience and diversity of ecosystems while allowing for sustainable use by humans of the goods and services they provide [6]. This definition imparts a holistic vision of ecosystem management by including humans as the users of goods and services. The introduction of humans into the approach necessitates the need to include human values such as equity, socioeconomic and cultural values as well as the harmony of their interrelationships. This perspective also implies the principle of integrated river basin management that involves a comprehensive inclusion of all land and water services (such as transport and fisheries), planning and regulation of human activities towards a complex set of interacting objectives to ensure long-term sustainability [6]. It simultaneously looks at all economic water-related sectors such as fisheries, water supply, agriculture and tourism, and recognizes the implications that originate from multiple functions of a resource. Thus, ecosystem-based management moves away from looking at human needs first (e.g. food and revenues) and then incorporating nature into these needs. Rather, it first takes stock of both the human and ecosystem needs and potentials and then tries to strike a sustainable balance of utilization. In philosophical terms, ecosystem-based management expresses a vision of 'partnership with nature' rather than the traditional attitude of 'mastery over nature' [7] and its success relies on a well coordinated policy framework.

Malawi does not have a national wetland policy and issues of wetlands (and floodplains) are only marginally present in the National Parks and Wildlife Policy [8], and in the National Fisheries and Aquaculture Policy [9]. As a result, the country lacks a management framework strong enough to

enforce a balanced and sustainable wetland development under rising pressures such as overexploitation and agricultural conversion which are mainly driven by population growth, rural poverty, climate change and market growth. In Elephant Marsh, additional drivers include fluctuation in water levels caused mainly by hydroelectric power generation at Kapichira Dam and the abstraction of water for irrigation by Illovo sugar estate; both located upstream. Moreover, the coordination of the roles of the various stakeholders in wetland management at Elephant Marsh is not very clear or stable.

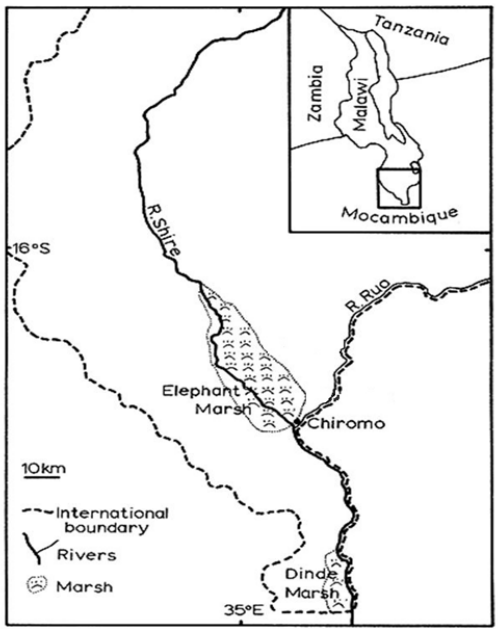
One specific purpose of the paper is to analyze the ecosystem-based potentials of the marsh as one way of assisting local communities in sustainably exploiting goods and services from the Elephant Marsh. Local communities have been engaging themselves in initiatives for wetland protection such as restoration of river banks thereby demonstrating their awareness of the value of the wetland. As such, an overview of the opportunities that lie at the Elephant Marsh is important for any balanced development planning of the area. The second specific purpose of the paper is to highlight existing local institutions pertaining to the management of the marsh. In order to avoid overexploitation, future development options will have to be efficient and effective. There is a need to build on local institutions; for example, as partners in co-management arrangements.

2. Location and Ecology

Elephant Marsh is located on the East African Rift Valley floor in the southern part of Malawi (14°25'–17°50'S and 35°15'–35°15'E), see Figure 1. It covers an average area of about 600 km^2, although actual size varies from about 2700 km^2 in the wet season to 500 km^2 in the dry season [2,10]. The variation creates season-oriented pressure on the ecosystem goods and services that communities can draw from the wetland. The Elephant Marsh straddles the administrative districts of Chikhwawa and Nsanje, which fortunately follow similar institutional arrangements and therefore no major trans-district problems arise. The region has an average altitude of 500 m above sea level and an annual precipitation range of 560 to 960 mm. The mean annual precipitation in Malawi is 1180 mm and the altitude ranges from 50 m asl to 3000 m asl. Four hydro-climatic seasons are identified, comprising (1) hot, dry weather with low river levels from July to September, (2) hot, windy, wet weather from October to December, (3) hot, humid, wet weather from January to March, and (4) humid, cool weather from April to June [2].

The marsh is fed by the Shire River, the only outlet of Lake Malawi, which flows through it in a southerly direction before joining the Zambezi river in Mozambique. It extends from the south eastern part of Illovo sugar estate to just above the confluence of Shire River and Ruo River at Chiromo. Since the Ruo River has a less buffered flow regime than the Shire, its peak flow levels can rise above those of the Shire's, causing backflow into the marsh, sometimes (1950, 1991, 2001, 2011, and 2012) with substantial flood damage [11].

Figure 1. Map of southern Malawi showing the position of Elephant Marsh. Source: [12].



The marsh has relatively grassy margins but the bulk of its surface is formed by a mosaic of rooted swamp vegetation (sudd), floating vegetation and open water. In the southern part, this pattern is interspersed with islands with saline soils and palm trees. Table 1 shows the typical flora and fauna found at the Elephant Marsh.

Table 1. Typical flora and fauna at the Elephant Marsh.

Scientific Name	English Name
Flora	
Nymphaea odorata	Water Lily
Eichhornia crassipes	water hyacinth
Pistia stratiotes	Water Lettuce
Azolla nilotica and *Salvinia molesta*	Floating Ferns
Phragmites australis	Common Reed
Vossia cuspidata	Hippo Grass
Typha domingensis	Cattail
Cyperus papyrus	Papyrus
Cyperus procerus	Sedge
Lonchocarpus capassa	Apple Leaf
Utricularia inflexa	Bladderwort
Hyphaene benguellensis	Vegetable-ivory Palm
Fauna	
Ardea purpurea	Purple Heron
Butorides striata	Green-backed Heron
Ardea goliath	Goliath Heron
Nettapus auritus	African Pygmy Goose
Anas undulate	Yellow-billed Duck
Erythrocercus livingstonei	Livingstone's Flycatcher

Table 1. *Cont.*

Scientific Name	English Name
Fauna	
Scotopelia peli	Pel's Fishing-owl
Telecanthura ussheri	Mottled Spinetail
Phalacrocorax lucidus	White-breasted Cormorant
Haliaeetus vocifer	African Fish Eagle
Alcedo atthis	Common Kingfisher
Alcedo cristata	Malachite Kingfisher
Anaplectes rubriceps	Red-headed Weaver
Ploceus cucullatus	Village Weaver
Tringa totanus	Common Redshank
Tringa nebularia	Common Greenshank
Bubulcus ibis	Cattle Egret
Merops boehmi	Boehm's Bee-eater
Tchagra minuta	Marsh Tchagra
Estrilda astrild	Common Waxbill
Actophilornis africanus	African Lily-trotter
Actitis hypoleucos	Common Sandpiper
Tringa stagnatilis	Marsh Sandpiper
Rostratula benghalensis	*G*reater painted Snipe
Philomachus pugnax	Ruff
Macronyx croceus	Yellow-throated Longclaw
Glareola pratincola	Collared Pratincole
Acrocephalus palustris	Marsh Warbler
Mycteria ibis	Yellow-billed Stork
Ardeola ralloides	Squacco Heron
Asio capensis	Marsh Owl
Rynchops flavirostris	African Skimmer
Crocodylus niloticus	Nile Crocodile
Hippopotamus amphibius	Hippopotamus

Sources: Field research, [13,14]

The Elephant Marsh is also home to several species of fish, out of which *Clarias gariepinus* (locally known as *mlamba*), *Oreochromis mossambicus (chambo), Oreochromis placidus (makumba)*, and *Barbus ssp. (matemba)* comprise over 90 percent of the commercial catch [15]. The Elephant Marsh traps a big amount of sediment each year, making water downstream clearer and less polluted. The wetland also acts as an ecological barrier between *Barbus johnstonii* (*Cyprinidae* family) of Lake Malawi and Upper Shire, and *Barbus marequensis* of the Lower Shire and Zambezi [16].

The International Union for Conservation of Nature (IUCN) red list identifies *Rynchops flavirostris* (African skimmer) and *Oreochromis mossambicus (chambo)* as species under threat in its natural range while the Convention on International Trade in Endangered Species (CITES) list includes *Crocodylus niloticus* (Nile crocodile) and *Hippopotamus amphibius* (hippopotamus). The Elephant Marsh is therefore a very important habitat for these species.

3. Ecosystem Services

Wetlands are important for many ecosystem services, such as fisheries, agriculture, livestock grazing, (eco) tourism, water supply, water purification, carbon sequestration, wildlife goods, biodiversity, and transport. Quite often however, wetlands are subjected to a development paradigm that maximizes the one or two ecosystem services for which markets are readily available such as cash crop production [17].

The Elephant Marsh wetland is one of the most productive ecosystems in Malawi, contributing to the livelihoods of thousands of households in Chikhwawa and Nsanje districts [18]. Agricultural production in and around the wetland relies on the wetland's year-round moisture and the fertile alluvial soils. Rainfall is usually erratic and rain-fed agriculture is becoming less reliable. The high productivity of the soils has been one of the major attractive factors for human settlement around the wetland since as early as the 3rd century AD [19]. With a natural population growth of 2.8% and an influx of people from upland and other districts such as Blantyre, Thyolo and Mulanje [20] coupled with rising poverty in Malawi, where 74 per cent of the population is living below the income poverty line of US$1.25 a day [21], pressure to convert the wetland to agricultural land is likely to increase. The 2008 population and housing census report for Malawi indicates that about 100,000 people had immigrated to Chikhwawa and Nsanje districts between 1998 and 2008 [20]. This represents about 14% of the original population thereby creating more pressure on the ecosystem goods and services of the Elephant Marsh.

Fisheries are an important sector of the Elephant Marsh. For Malawi as a whole, fish contribute 60 percent of the animal protein intake [2], and the fisheries industry directly employs over 60,000 people, and indirectly engages 500,000 beneficiaries through fish processing, transportation, marketing, as well as boat building and repairs [22,23]. Fishing mostly occurs between April and July when flood waters are receding and the fish becomes easier to catch. The annual fish production from around the Elephant Marsh has been estimated at an average of 8500 tonnes [10]. This figure possibly includes the lower sections of the Shire River downstream from Elephant Marsh but generally indicates an annual production of 141.7 kg/ha. There are no recent data on the economic value of fisheries exploitation at the Elephant Marsh partly due to lack national interest in carrying out research on common pool resources such as the Elephant Marsh. Unfortunately, such data is very important for future impact assessment studies. Based on 1990 data on production and market prices, the economic value of Elephant Marsh fisheries was estimated at US$ 1.1 million per year [24]. Fish prices change quite fast in Malawi. For instance, the average fish price at rural markets in Malawi rose from MK 88.05 (US$ 0.53)/kg in 1999 [25] to MK 210.19 (US$ 1.29)/kg in 2001 [26] implying that fisheries value at the Elephant Marsh is certainly higher at present than in 1990.

Fishing is complemented by recession agriculture in terms of both household labor and income [2]. The major crops grown in and around Elephant Marsh include rice, maize, sorghum, millet, beans, cassava and sweet potatoes. The cash crops are mostly sold at the local markets and then transported by traders to bigger towns and cities [27]. The economic value of Elephant Marsh's recession agriculture was estimated at US$ 0.7 million per year in 1990 [24].

Elephant Marsh is used for livestock grazing which include an estimated 104,450 cattle [10]. The estimated economic value of Elephant Marsh for grazing was at US$1 million per year

in 1990 [24]. The wetlands are a source of good, year-round fodder (mainly sedge and young reed) and watering points for the animals. The best grazing period in the wetlands however is during the dry season. Unfortunately, this coincides with the breeding season for crocodiles posing a danger to livestock and herders. Crocodiles are generally looked upon as enemies by the local people because of attacks and competition for fish. They have also been seriously hunted for their eggs, meat and skin. In 1997, for example, over US$ 23,000 was generated from the sale of 200 skins, which were exported to fashion houses in countries like France [5]. The poaching has led to reduction in crocodile populations. Our own field visits in 2011 showed that hippos too are hunted, with meat sold locally. Numbers and values are as yet unknown.

The estimated total economic value of Elephant Marsh in 1990 of US$ 2.8 million per year [24], besides being outdated to some extent, notably excludes other important ecosystem services such as water supply, water purification, transport, natural products and biodiversity.

4. The People and Their Traditions

The indigenous people at the Elephant Marsh are the Mang‘anja but many other ethnic groups have migrated to the area, most notably the Sena [28]. Other ethnic groups in the area include: Lomwe, Yao, Chewa, Ngoni, Tonga and Tumbuka. The Man’ganja are usually specialized farmers while the Sena tend to engage more in fishing and livestock keeping, with a relatively business-oriented outlook.

There are five main traditional areas (commonly known as Traditional Authorities) around the Elephant Marsh, namely: Makhuwira, Mlolo, Lundu, N’gabu and Mbenje. Apart from their communal power, traditional authorities also act as the intermediaries between spirit worshiping communities and their gods. A rain cult among the Mang’anja worships Mbona whose head is believed to have been cut off hundreds of years ago leading to an outflow of a river of blood. Mbona is said to annually return to the home of his wife (Salima) in the form of a snake that foretells what will happen in the coming year [29,30]. The Mbona cult has been linked to population movements, settlement patterns, acceptance or non-acceptance of immigrants. In the 1930s, Mbona, through Traditional Authorities, directed the population to emigrate and relieve pressure on the marshes of the Lower Shire as a reaction to perennial flooding of the marshlands [31].

There are four categories of land tenure in Malawi namely; customary land, public land, leasehold and freehold. Ownership of land at the Elephant Marsh is based on customary tenure and access to land is through kinship or marriage, depending on ethnic cultures and traditions. For example, the Man’ganja system of succession and inheritance is matrilineal while the Sena system is patrilineal whereby inheritance follows the male line and the wife moves to her husband's village. These original traditions and norms have now been eroded by intermarriage, modernization and intermingling between the different tribes [29,30,32]. However, in accordance with the National Land Policy of 2004, land under customary tenure is communal and cannot be sold outside the community. Communal land is governed by customary law, in which the traditional leaders are the custodians of the land [33–35].

5. Management Arrangements

The Elephant Marsh and Lake Chilwa were mandated as the first two protected game reserves in Malawi in 1897. The aim was to protect the large game animals, including elephants, which were common in the area. It is reported that one of the early missionary explorers to Malawi, David Livingstone, met a huge herd of around 800 elephants in the wetland hence the name Elephant Marsh [13]. The customary management institutions that prevailed in the unprotected areas (common pool resources) all over the country were mainly influenced by secular and religious powers of traditional chiefs. For example, there were ritual prohibitions of hunting in forests associated with shrines such as the Mbona among the Mang'anja [36]. The enforcement of natural resource management regulations has, however, never been very effective [27] and was largely interrupted by the two world wars [36]. The final loss of statutory protection of the Elephant Marsh and Lake Chilwa seems to have occurred during the transition from colonial rule to the then newly independent government in 1964 [37] that lacked a well-coordinated legal and institutional setup.

Due to its customary tenure status, the Elephant Marsh is managed by local institutions with little input from the central government. In Malawi, the hierarchy of power has been devolved from central government to give authority to District Assemblies (DAs) to make local decisions that may favor development [38]. For example, the formation and implementation of by-laws to support fisheries management in a particular area is done by DAs. The DAs (made up of elected politicians and councilors; inherited traditional authorities; and appointed, influential members of society such as religious leaders and officials from non-governmental organizations) get advice and guidance from District Executive Committees (DECs), which are formed by government employees from different departments in the district. Decision making at this level is based on consensus between DAs and DECs [38,39]. The next lower level is headed by the Traditional Authorities (TAs) and comprises Group Village Chiefs who make Area Development Committees (ADCs). Authority at this level comes from DAs but support and technical advice is given by Area Executive Committees (AECs), which are made up of extension workers from government and representatives from non-governmental organizations. Decisions made by ADCs are passed on to Group Village Development Committees (headed by Group Village Chief and comprised of traditional village chiefs) for implementation at the community level through Village Development Committees. Decisions made at all these levels are generally accepted by the people because of involvement of chiefs who traditionally, have a lot of power.

At the village level and under guidance of the village chief, each development sector is represented in the form of an executive committee that is responsible for coordination of specific activities. Figure 2 depicts the overall arrangement.

In the fisheries sector, the village level committee is called Beach Village Committee. Access to the Elephant Marsh is controlled through customary law by the Beach Village Committees, operating through Beach Chairs. Beach chairs are strategically positioned at entry canals that lead into the wetland. Figure 3 shows one of the entry points. The house on the left is where the Beach Chairman sits to run the fishing affairs of his area of jurisdiction. Some twenty Beach Chairs are found around Elephant Marsh.

Community members can get access rights by paying an annual fishing license fee of MK 360 (US$ 2.19) to the department of fisheries. The fee is quite low compared to the value of fish and can be afforded by most members of the community. Figure 4 captures local relations that exist in managing the fishery at Elephant Marsh.

Based on our field visits in 2011, the arrangement appears to be working smoothly; one strength being that it assures community membership of the wetland users. Immigrants are restricted from access to the wetland but are allowed, for example, as fish traders. In most cases, they are easily identified and are fondly referred to as "*Angoni*" meaning "outsider" (although *Angoni* is a name of an ethnic group).

Figure 2. The power hierarchy at district level in relation to local communities. Adapted from [38].

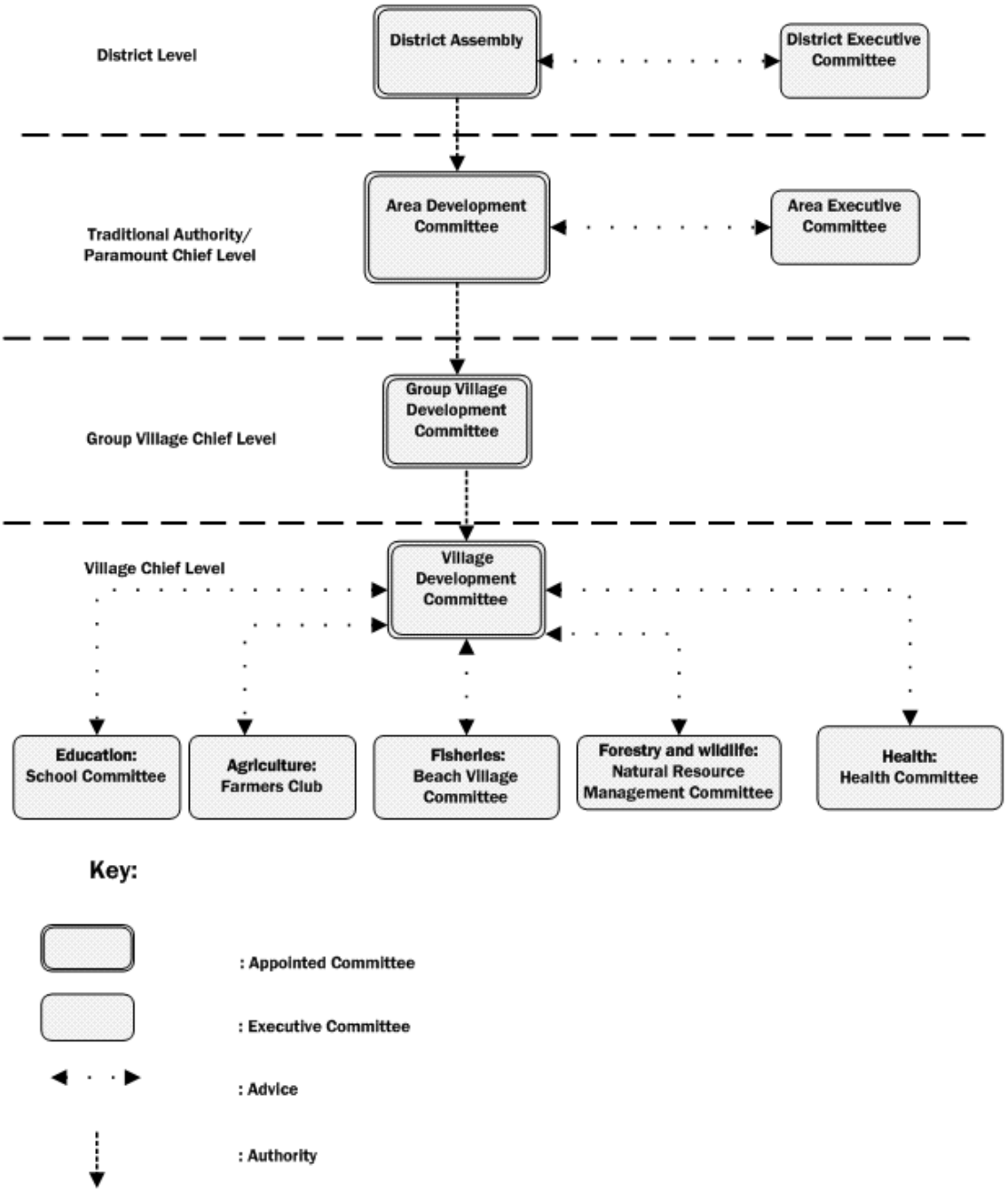
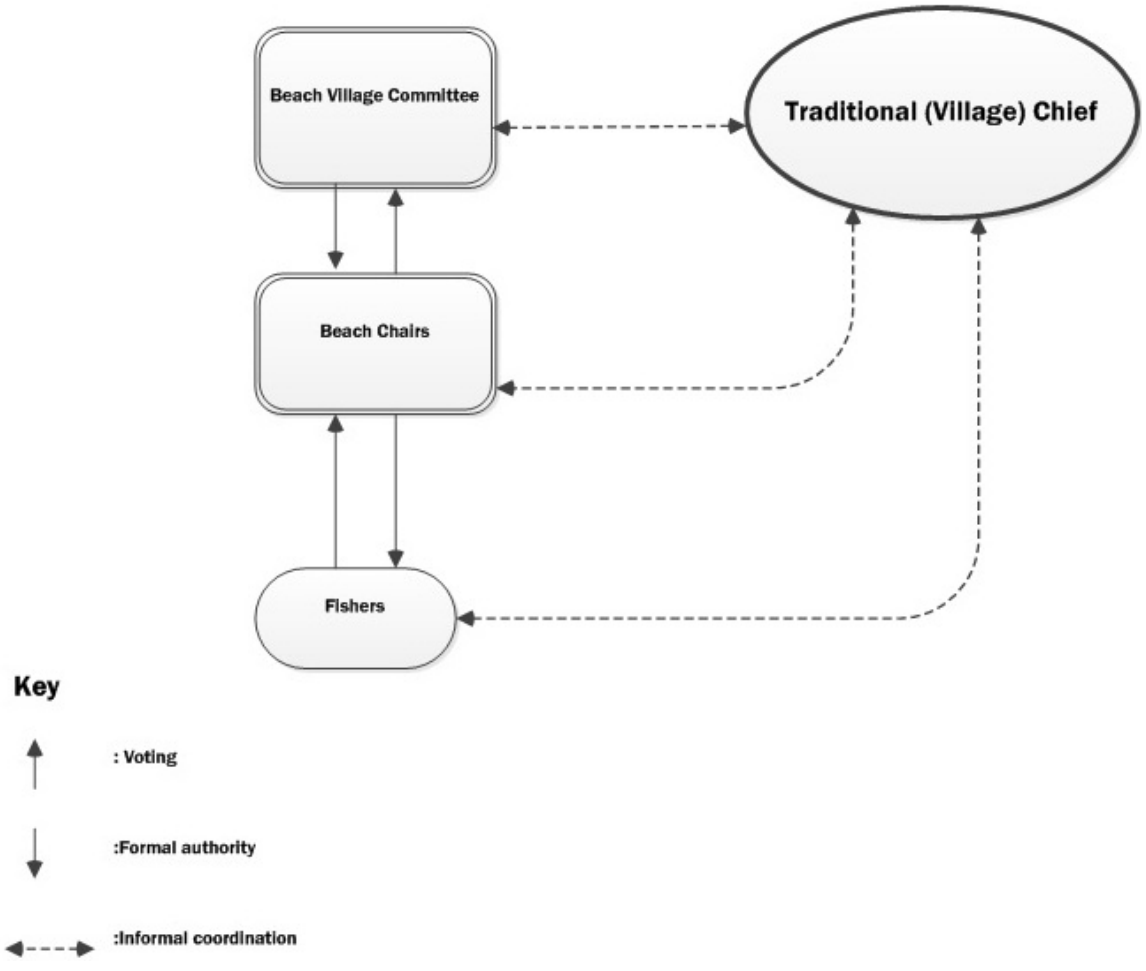


Figure 3. One of the entry points into the Elephant Marsh. In the background, fishermen prepare to go out. The poles are used to push the boats and measure water depth.

Figure 4. Organization of local fisheries management at the Elephant Marsh.



6. Ecosystem-Based Potentials of the Elephant Marsh

The Elephant Marsh has rich alluvial soils that favor most crops including rice and maize. The current agricultural activities around and inside the Elephant Marsh are mostly for household food and not large scale commercial purposes. Prospects for undertaking large scale commercial agriculture (rice and maize production) are strong however, given the currently low opportunity cost of labor and the proximity of urban markets. This would increase employment opportunities as well as the average income levels of the local people. At the same time, these very prospects might lead to big-time investment to drain and convert the wetland into a large-scale irrigation scheme. Although a detailed discussion of such irrigation schemes lies outside the scope of this paper, any analyst would have to be concerned with the possible negative effects of such schemes such as loss of ecosystem goods and services. The communities are currently organizing themselves in small scale commercial farming groups and obtaining loans from money lending institutions (such as Malawi Union of Savings and Credit Cooperatives) to support initiatives that reduce wetland degradation such conservation agriculture.

Increased fish production in the Elephant Marsh appears to be an opportunity. The wetland is a good breeding ground for many species of fish and the good road network to Malawi's commercial capital of Blantyre (at about 120 km) and other densely populated districts puts the Marsh in a good economic position. If proper ecosystem management approaches are adopted, the fish catch will increase. For example, Denny *et al.* [39] have proposed integration of smallholder wetland aquaculture into farming activities at Yala Swamps in Kenya, a wetland similar to Elephant Marsh; in a system they termed 'fingerponds'. In this approach, small ponds are dug into the wetland and used for fish production while the excavated soil is used to create raised bed gardens for vegetable production.

The hippopotamus that are found in the wetland are known to maintain the channels that enable fishing and probably also enhance fish productivity by creating more landscape diversity. During our field visit in 2011, fishermen complained that the channels are becoming too narrow due to declining numbers of hippopotamus. Harvesting reeds and floating vegetation for energy (see below), done in such a pattern that there is a balance with natural primary production in the swamp may also create more open water and enhance fish production.

Papyrus and reeds grow thickly in the Elephant Marsh and are used locally to make mats, hats, chairs, thatch, granaries, baskets and fishing gear. Papyrus is also used as a lining for coffins. Lily bulbs (locally known as *nyika*) are sometimes eaten for carbohydrates especially in years of poor crop harvest [10]. Value addition, crafts development plus urban and tourist marketing of these products may promote the livelihood of the locals and enhance their motivation to protect the ecosystem.

Malawi is a country faced with acute energy shortages. Only 8 percent of the population has access to electricity. The papyrus and reeds may therefore relieve the energy demand by acting as a source of bio-energy. A similarly high bio-energy resource potential from reed harvesting in Poland has been uncovered [40]. Reed (*Phragmites australis*) is a herbaceous lignocellulolic crop with a net calorific value of 4944.4 kWh/ton [41] and an annual above-ground production of 20 tonnes per hectare [42]. Assuming 60 percent of the Elephant Marsh has reed growth, 480,000 tons could be annually produced using biogasification (decomposing the vegetation into methane, using anaerobic bacteria), having a calorific value of 2.37×10^9 kWh. Theoretically, this could be converted into a steady 10 to

20,000 kW [41,43–46], which is about 3 percent of Malawi's total installed electricity capacity of 302 MW [47].

How this energy potential might be utilized requires more research. It might well be, for instance, that solar panels, combined with a small battery and LED lamps, would be the superior solution for household-level lighting needs. The biomass energy from the marsh could then be used for heavier electricity demands (communal video centers, maize mills, *etc.*), especially in villages that lie close to the marsh's entry points where the biomass can easily be transported by boat. Another energy option to be explored is to focus on heat rather than electricity production, e.g. making briquettes as an alternative for firewood [48].

The landscape and fauna at the Elephant Marsh and the rich cultural and historical heritage of the people around it [32,49] make it a potential destination for social and ecotourism. A joint effort of the Mlambe Foundation of the Netherlands, the Museums of Malawi and the Department of Antiquities has created a heritage center called *Tisunge* (which means 'Let us keep') at the entrance gate of nearby Lengwe national park to preserve Lower Shire's historical and cultural heritage. Archeologists and oral traditions have revealed small stone and iron tools from short-statured foragers of the 3rd century AD, referred to as *Batwa* [50]. The center has a library, a small museum and a children's club.

Tourism in Malawi is estimated to contribute about US$ 159 million per year and employs about 5 percent of the population. Ecotourism may not only support conservation efforts but also boost the economic activities of the local people in the area. There are already two well known protected areas in the proximity of the Elephant Marsh (Majete game reserve and Lengwe national park). While there are no data on the ecosystem dynamics in the wetland at the time of Livingstone's journeys to the area, it would be interesting to connect the management plan with those of the protected areas both biologically and in terms of tourist packages. The Elephant Marsh could specialize in bird watching. This could then be combined with 'social tourism' for travelers who want to stay with a local family, learn their culture, join fishing and village life, and follow the footsteps of Livingstone. Social and ecotourism can create new livelihoods and act as an incentive for conservation and other sustainable livelihood activities such as beekeeping. The initial stages require collaboration with the protected areas and investment in at least one fast and trustworthy tourist boat. A good example of successful wetland ecotourism in sub-Saharan Africa is the Okavango Delta in Botswana. On the downside of this potential, it is worth remembering that wetlands can be a breeding ground for such diseases as malaria and schistosomiasis [51]. A health risk assessment needs to be done before social and ecotourism is to be stimulated.

7. Towards Co-Management of the Elephant Marsh?

The exploitation pressure on the Elephant Marsh will certainly rise due to background developments such as population growth, market forces, rural poverty and climate change. During 2011, the consumer price index for various rural commodities in Malawi rose by about 5% [52]. If the food prices (including fish) and energy shortages will continue to increase, there is likelihood that powerful outsiders such as business oriented citizens from other parts of Malawi and abroad would buy or force their way in (usually through village headmen), move away the natives to resettle elsewhere

and exploit the Elephant Marsh, for example, for large scale commercial agriculture. Such cases have happened at Likangala Irrigation Scheme in Malawi and Gambella rice paddy in Ethiopia.

On top of that, any realization of the development potentials discussed above will make the wetland more attractive for use by both locals and outsiders. In Section 5, we have seen that the current local management arrangements appear to be working well but also that they are quite informal and not protected by strong central institutions or state involvement. The question therefore arises to what extent and in which way institutions need to be strengthened in order to prevent them to succumb under the rising tide of interested exploiters. Will management institutions remain strong enough if purely locally based? Can local institutions be entrusted to also safeguard the supra-local ecosystem services performed by the Marsh? These questions indicate that institutional analysis is warranted, especially with a view to explore the option to engage government in the guidance and protection of the local arrangements and organizations.

The question of how to manage common pool resources (CPR)—of which the Elephant Marsh in an example—was raised in the late 1970s by the U.S. treaty tribes in the western part of Washington State to describe the relationship they aspired to have with state managers over fisheries management [53]. This happened a few years after Garrett Hardin had published his seminal article on "The Tragedy of the Commons" [54] which, based on a rational choice logic, proclaimed that any common pool recourse will ultimately be overexploited to the ruin of all. Even though empirical social scientists have demonstrated convincingly that this idea is often contradicted by real-world facts, it remains true that common property regimes can function sustainably only under certain conditions [55] and can fail under increasing outside pressure [55]. "The Tragedy of Common Access" therefore arises from lack of support and strong recognition by central states of the locally developed institutions, which usually are better placed to manage common pool resources [56,57]. Ostrom [55] highlighted the need to nest smaller common property systems such as the Elephant Marsh in bigger enterprises, for example, wetland management frameworks at national level so that issues of cross scale cooperation can best be addressed. Currently, the central state in Malawi does not fully recognize the right of local resource users at the Elephant Marsh to create their own management institutions. This situation jeopardizes the sustainability of the local wetland management institutions at Elephant Marsh.

Central states can have many roles in common property management [58]. Some are negative, e.g. usurping or undermining local institutions. Others are positive, such as actively protecting common land against intrusion by outsiders. Local institutions therefore evolve and reposition themselves around internal and external factors that best represent the legitimacy, ideologies and economic interest of more powerful actors [59,60]. This unfortunately encourages open access constellations where external actors tend to benefit more [59] because central states fail to enforce formal rules to control the activities of intruders. This "New Institutional Approach" [59,61] usually leads to a shift towards leasehold land tenure systems, which disadvantages the locals and a subsequent erosion of local institutions [60]. 'Co-management' is the term coined for arrangements in which government and communities or user groups share responsibilities over a resource. Co-management has been engineered early in fisheries practice [55,62] but presently gains an ever widening application like in forest management [63]. Experience from elsewhere (such as Kafue Flats Floodplain Wetland in Zambia) has however shown that although co-management arrangements promise many theoretical benefits, there is usually limited involvement and cost-benefit analysis of local group interests [59–61].

Africa offers a fertile ground for co-management, because community-based management of common pool resources was historically built on the heritage of communalism [64] that utilized complementary and mutually beneficial traditional systems [65,66]. The local level systems were based on locally specific knowledge of resource dynamics and resource users [67] and therefore tended to vary much between locations. For the same reason, present-day institutional scientists emphasize that co-management arrangements need to be locally crafted; there is no "one size fits all" model [68]. In Africa, recent examples of co-management approaches include the Community Wildlife Service (CWS) in Kenya; Communal Areas Management Program for Indigenous Resources (CAMPFIRE) in Zimbabwe; Administrative Management Design for Game Management Areas (ADMADE) in Zambia; and Community Partnerships for Sustainable Resources Management (COMPASS) in Malawi. In all these arrangements, there is a defined system boundary around a natural resource and set rules that regulate entitlement of ownership and use. Co-management in all these cases depends on a good integration of local regimes into national systems. When a natural resource is not protected by the state, for instance, the dynamics of the right to own, the right to use, and the conflicts of user rights and obligations become central. The COMPASS project, which was concluded in 2009, aimed at enhancing the capacity of rural communities to sustainably manage natural resources and improve household income from sales of natural resource-based products. The project was a success because it worked extensively with community based organizations and communities saw immediate benefits through diversified livelihood sources, food availability and activities that promoted natural resources management. Due substantial community involvement in both the COMPASS project and the current management arrangements at Elephant Marsh and the similarity in intended outcomes, there are many lessons that may be replicated.

Institutional theories can of course be used in the design of co-management arrangements. Examples are the populist approach [55,69] the neo-liberal approach [70–72] and the classical approach [70,73]. But as said, the art of successful system design is not so much in theory-led panaceas but in locally based institutional '*bricolage* ' [74–75] in which universal criteria such as efficiency and equity are built into existing traditions and institutions as discussed in Sections 4 and 5 of this paper.

8. Concluding Remarks

For Elephant Marsh and many other similar wetlands, the first action is to explore the need of institutional strengthening *vis-à-vis* the rising pressures of the business-as-usual scenario and a scenario of possibly successful realization of ecosystem-based development potentials. This can take the form of a negotiated consensus between an outsider assessment and the community's own assessment of institutional strengths and weaknesses. This then would be a basis for an open-ended process of participatory institutional *bricolage* that focuses on the points where engagement of the state is most needed. One outcome could be that the state would confine itself to regulation of access by outsiders and safeguarding of a number of supra-local values such as sustainability, biodiversity and external ecosystem services, and leaves all else to the communities to manage.

The latest Malawi State of Environment and Outlook report [15] highlights that many wetlands in Malawi (including Elephant Marsh, Ndindi Marsh, Marshes of Chitipa, Lake Chilwa, Rungwenya) are

under major threat due to anthropogenic activities, mainly agricultural conversion [15]. Malawi needs to develop a wetland policy that will help in promoting a balanced and sustainable wetland management for multiple resource users under increasing pressure from population growth, poverty, overexploitation, a changing climate and agricultural conversion. The policy would therefore be of particular essence in protecting the many Malawian wetlands that are under similar circumstances as the Elephant Marsh. Realizing the importance of the Elephant Marsh, it would be paramount to designate it as a Ramsar site with the aim of enhancing the opportunities highlighted earlier in this paper and to arouse interest in scientific studies, local community awareness and involvement as well as funding opportunities for the protection of the wetland. Although designation of a wetland as a Ramsar site may lead to wise use and protection, it should be noted that there is need for strong national and international programs that promote community awareness and involvement in managing wetland ecosystems. For example, although Lake Chilwa is a Ramsar site, it still faces challenges such as inadequate national and international support for implementation of the management plan that was developed in 2001 with funds from the Danish International Development Agency (DANIDA); this includes the allocation of water, ecosystem degradation resulting from poor agricultural practices and the overexploitation of natural resources (mainly bird hunting for food) by local communities. The Ramsar status of any wetland alone is not enough as a management option unless it is coupled with other initiatives that promote sustainable livelihoods of local communities. It is also important to improve data collection schemes at the Elephant Marsh so that decision making by local and national institutions as well as policy formulation and implementation are based on real time information. This study has revealed that if the available opportunities are to be efficiently and effectively exploited at the Elephant Marsh, there is need to rise above the institutional design principles of Ostrom [55] which are based on nested enterprises and move towards real participatory approaches such as constitutionality (local people's sense of ownership in bottom-up institution building). There is need to strike a balance between the local wetland management system, where pressure on the Elephant Marsh emanates mainly from poverty, and the national and international interests of biodiversity conservation as advocated by the Ramsar convention. Although enhanced production and maximum benefits from ecosystem good and services are central to any management system of the Elephant Marsh, it is important to realize that there are always limits to growth. Any management program for the Elephant Marsh should therefore strive towards sustainable exploitation of the opportunities that lie in the wetland's goods and services.

Conflict of Interest

The authors declare no conflict of interest.

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